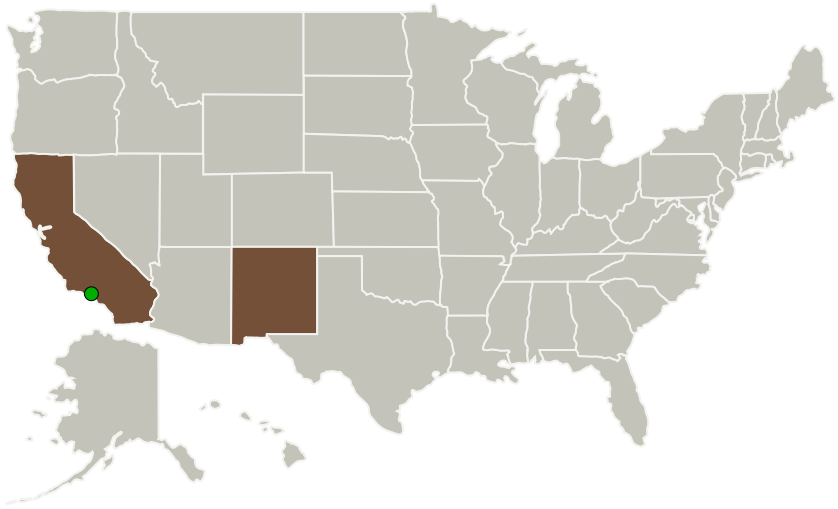
High-Temperature Superconducting Thin Films for IR Detectors, Phase I

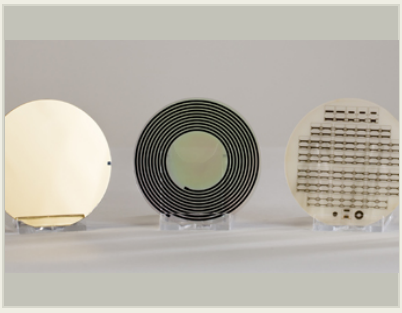
Completed Technology Project (2016 - 2016)

Project Introduction

The development of the microwave kinetic inductance detector (MKID) has renewed interest in bolometric infrared detectors based on thin films of YBa2Cu3O7-x (YBCO) high temperature superconductor (HTS). A compelling advantage of HTS bolometers is that they can be operated at temperatures of around 50 K, which significantly reduces the complexity of the cooling requirements. To be viable for large-scale production of HTS bolometer detector arrays, high-quality, thin YBCO films are required on large-area Si wafers for increased throughput and to fabricate the membrane structures that support the YBCO bolometers. YBCO deposition on Si requires optimized MgO buffer layers deposited using ion beam assisted deposition (IBAD). Currently there is no domestic commercial source for YBCO films. In Phase I, we propose to improve the uniformity of currently available YBCO films on Si, and to design an innovative reactive co-evaporation system for the deposition of high-quality films of YBCO on large-area substrates that will be built and commissioned in Phase II.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
STAR Cryoelectronics, LLC	Lead Organization	Industry	Santa Fe, New Mexico
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	New Mexico

Project Transitions

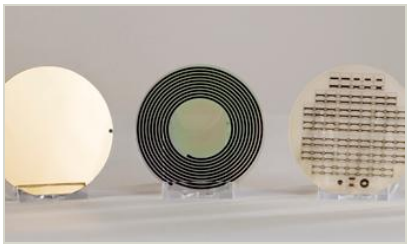
June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139846)*

Images



Briefing Chart Image
High-Temperature Superconducting Thin Films for IR Detectors, Phase I *(https://techport.nasa.gov/image/125858)*

Final Summary Chart Image
High-Temperature Superconducting Thin Films for IR Detectors, Phase I Project Image *(https://techport.nasa.gov/image/126028)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
STAR Cryoelectronics, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

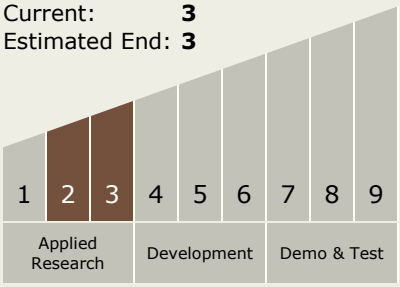
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Robin H Cantor

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System